
सिरैमिक टाइलें — परिक्षण पद्धतियां,
नमूने लेने तथा स्वीकार्यता का आधार
भाग 15 नमूने लेने एवं स्वीकार्यता का आधार
(पहला पुनरीक्षण)

**Ceramic Tiles — Methods of Test,
Sampling and Basis for Acceptance**
Part 15 Sampling and Basis for Acceptance
(*First Revision*)

ICS 91.100.23

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FOREWORD

This Indian Standard (Part 15) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Flooring, Wall Finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard (Part 15) was first published in 2006. This first revision incorporates the experience gained with the use of this standard and brings the standard in line with the latest developments in this field.

The following are the significant modifications incorporated in this revision:

- a) The sampling procedure has been updated to include bulk density, breaking strength, slip resistance, etc.

This Indian Standard is published in several parts. The other parts in this series are:

- Part 1 Determination of dimensions and surface quality
- Part 2 Determination of water absorption and bulk density
- Part 3 Determination of moisture expansion using boiling water
- Part 4 Determination of linear thermal expansion
- Part 5 Determination of resistance to thermal shock
- Part 6 Determination of modulus of rupture and breaking strength
- Part 7 Determination of stain and chemical resistance of unglazed tiles
- Part 8 Determination of stain and chemical resistance of glazed tiles
- Part 9 Determination of crazing resistance of glazed tiles
- Part 10 Determination of frost resistance
- Part 11 Determination of resistance to surface abrasion of glazed tiles
- Part 12 Determination of resistance to deep abrasion of unglazed tiles
- Part 13 Determination of scratch hardness of surface according to Mohs' scale
- Part 14 Determination of impact resistance by measurement of coefficient of restitution
- Part 16 Determinations of lead and cadmium given off by glazed tiles

In the formulation of this standard considerable assistance has been derived from the ISO 10545-1 :1995 'Ceramic tiles — Part 1: Sampling and basis for acceptance'.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

CERAMIC TILES — METHODS OF TEST, SAMPLING AND BASIS FOR ACCEPTANCE

PART 15 SAMPLING AND BASIS FOR ACCEPTANCE

(*First Revision*)

1 SCOPE

This standard (Part 15) defines rules for batching, sampling, inspection and acceptance/rejection. It applies to unfixed ceramic tiles that have been stored under cover.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2500 (Part 1) : 1992	Sampling inspection tables: Part 1 Inspection by attributes and by count of defects (<i>second revision</i>)
2500 (Part 2) : 1965	Sampling inspection tables: Part 2 Inspection by variables for percent defective
13712 : 2006	Ceramic tiles — Definitions, classifications, characteristics and marking

3 PRINCIPLE

This standard provides for a sampling inspection system with a double sampling plan, partly for the method of inspection by attributes (individual values) and partly for a method of inspection by average values (variables). The number of tiles to be tested varies for each property (*see* Table 1).

4 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

4.1 Order — A quantity of tiles ordered at one time. An order may consist of one or more consignments

4.2 Consignment — A quantity of tiles delivered during a period of two days.

4.3 Homogeneous (Sub) Consignment — A (sub) consignment that consists of tiles from one manufacturer under conditions and with properties that are presumed uniform.

4.4 Inspection Lot — A quantity of tiles submitted for inspection manufactured under conditions and with properties that are presumed uniform.

4.5 Sample — A specified number of tiles taken from an inspection lot.

4.6 Sample Size — The number of tiles to be tested for each property.

4.7 Requirement — A required characteristic as specified for the property in the product standard concerned.

4.8 Non-conforming Unit — A tile that does not meet the requirement for the property concerned.

5 CONSTITUTION OF INSPECTION LOT

An inspection lot may consist of one or more homogeneous consignments or homogeneous sub consignments. Any consignment, which is not homogeneous, shall be divided into sub-consignments, which are assumed to be homogeneous and then may constitute inspection lots. If the non-homogeneity is not relevant to the properties to be tested, then by agreement between the supplier and the consumer, the consignment can be treated as homogeneous.

NOTE — For example a consignment can be homogeneous with regard to dimensions and water absorption of nominally the same body with different glazes and non-homogeneous with regard to surface quality. Also accessories, which differ only in shape from the remaining tiles in the sample may be considered homogenous with respect to other properties.

6 EXTENT OF THE INSPECTION

The choice of properties to be considered for inspection shall be subject to agreement between the supplier and the consumer and may depend on the size of the inspection lot. While all the tests in relation to the technical specification are required to be performed, Annex B of IS 13712 may be used as a guideline to classify the relative importance of each property in relation to the application.

NOTE — In principle a complete range of tests shall only be executed for inspection lots of more than 5 000 m² of tiles. Testing is usually not considered to be necessary for inspection lots of less than 1 000 m² of tiles. The number of inspection lots to be drawn for testing shall be subject to agreement between the parties concerned.

7 SAMPLING

7.1 The place where samplings shall take place shall be subjected to agreement between the supplier and the consumer.

7.2 One or two representatives of each party concerned may be present at the time the sample is taken.

7.2.1 Sample shall be taken at random from the inspection lot.

7.2.2 Two samples shall be taken. It may not be necessary to test the second sample. Each sample shall be packed separately and shall be sealed and marked as agreed by the parties concerned.

7.3 For each property the number of tiles to be tested is indicated as 'sample size' in Table 1.

8 INSPECTION

8.1 The extent of the tiles in the sample shall be executed according to the test methods specified in the relevant standard.

8.2 The test results shall be evaluated according to 9.

9 DETERMINATION OF ACCEPTABILITY OF INSPECTION LOT

9.1 Inspection by Attributes

9.1.1 When the number of non-conforming units found in the initial sample is equal to or less than the acceptance number Ac_1 , indicated in col 4 of Table 1, the inspection lot from which the sample was drawn shall be considered acceptable.

9.1.2 When the number of non-conforming units found in the initial sample is equal to or greater than the rejection number Re_1 , indicated col 5 of Table 1, this justifies rejection of the inspection lot.

9.1.3 When the number of non-conforming units found in the initial sample lies between the acceptance number and the rejection number (*see* col 4 and col 5 of Table 1), a second sample of the same size as the initial sample shall be drawn and tested.

9.1.4 The number of non-conforming units found in the initial and second sample shall be totaled.

9.1.5 If the number of non-conforming units is equal to or less than the acceptance number Ac_2 Indicated in col 6 of Table 1, the inspection lot shall be considered acceptable.

9.1.6 If the total number of non-conforming units is equal to or greater than the second rejection number Re_2 indicated in col 7 of Table 1, justifies the rejection of the inspection lot.

9.1.7 When the relevant Indian Standard calls for more than one properties to be tested, the second sample taken (*see* 9.1.3) shall only be inspected in accordance with those tests which at the inspection of initial sample gave number of non-conforming units between the acceptance number Ac_1 and the rejection number Re_1 .

9.2 Inspection by Average Value

9.2.1 If the average value ($\bar{x}_1$) of the test results of the initial samples meets the requirements, the inspection lot shall be considered acceptable.

9.2.2 If the average value ($\bar{x}_1$) does not meet the requirements, a second sample shall be drawn of the same size as the initial sample (*see* Table 1, col 9).

9.2.3 If the average value of the ($\bar{x}_2$) test results of the combined initial and second samples meets the requirements, the inspection lot shall be considered acceptable (*see* Table 1, col 10).

9.2.4 If the average value ($\bar{x}_2$) does not meet the requirements, this justifies rejection of the inspection lot (*see* Table 1, col 11).

10 FIELD TEST

Following tests which may be carried out in the field are:

- a) Dimensions; and
- b) Surface quality, etc.

11 ACCEPTANCE REPORT

Report with reference to this Indian Standard:

- a) Identification of the tiles;
- b) Sampling procedure;
- c) Constitution of the inspection lot; and
- d) Determination of acceptability for each of the properties tested.

Table 1 Sampling Criteria
(Clauses 3 and 7.3)

Properties	Sample Size		Inspection by Attribute, if Required				Inspection by Average Value, if Required				Test Method as Per IS 13630
			Initial Sample		Initial + Second Samples		Initial Sample		Initial + Second Samples		
	Initial Number	Second Number	Acceptance Number Ac ₁	Rejection Number Re ₁	Acceptance Number Ac ₂	Rejection Number Re ₂	Acceptable if	Second Sample To be Drawn if	Acceptable if	Rejection Justified if	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dimension ¹⁾	10	10	0	2	1	2	—	—	—	—	Part 1
Surface quality ²⁾	30	30	1	3	3	4	—	—	—	—	Part 1
	40	40	1	4	4	5	—	—	—	—	
	50	50	2	5	5	6	—	—	—	—	
	60	60	2	5	6	7	—	—	—	—	
	70	70	2	6	7	8	—	—	—	—	
	80	80	3	7	8	9	—	—	—	—	
	90	90	4	8	9	10	—	—	—	—	
	100	100	4	9	10	11	—	—	—	—	
1 m ²	1 m ²	4 Percent	9 Percent	5 Percent	>5 Percent	—	—	—	—		
Water absorption ³⁾	5 ⁴⁾ 10	5 ⁴⁾ 10	0 0	2 2	1 1	2 2	$x_1 > L^{5)}$ $x_1 < U^{6)}$	$x_1 < L$ $x_1 > U$	$x_1 > L$ $x_1 < U$	$x_1 < L$ $x_1 > U$	Part 2
Modulus of rupture ³⁾	7 ⁷⁾ 10	7 ⁷⁾ 10	0 0	2 2	1 1	2 2	$x_1 > L$	$x_1 < L$	$x_1 > L$	$x_1 < L$	Part 6
Breaking strength ³⁾	7 ⁷⁾ 10	7 ⁷⁾ 10	0 0	2 2	1 1	2 2	$x_1 > L$	$x_1 < L$	$x_1 > L$	$x_1 < L$	Part 6
Scratch hardness (Mohs)	3	3	0	2	1	2	—	—	—	—	Part 13
Bulk density	3	3	0	2	1	2	—	—	—	—	Part 1
Resistance to abrasion UGL	5	5	0	2 ⁸⁾	1 ⁸⁾	2 ⁸⁾	—	—	—	—	Part 12
Coefficient of linear thermal expansion	2	2	0	2 ⁹⁾	1 ⁹⁾	2 ⁹⁾	—	—	—	—	Part 4
Resistance to thermal shock	5	5	0	2	1	2	—	—	—	—	Part 5
Crazing resistance	5	5	0	2	1	2	—				Part 9

Table 1 (Concluded)

Properties	Sample Size		Inspection by Attribute, if Required				Inspection by Average Value, if Required				Test Method as Per IS 13630
			Initial Sample		Initial + Second Samples		Initial Sample		Initial + Second Samples		
	Initial Number	Second Number	Acceptance Number Ac ₁	Rejection Number Re ₁	Acceptance Number Ac ₂	Rejection Number Re ₂	Acceptable if	Second Sample To be Drawn if	Acceptable if	Rejection Justified if	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chemical and stain resistance UGL ¹⁰⁾	5	5	0	2	1	2	–	–	–	–	Part 7
Chemical and stain resistance GL ¹⁰⁾	5	5	0	2	1	2	–	–	–	–	Part 8
Resistance to abrasion GL PEI ¹¹⁾	11	–	Attribution by manufacturer’s declaration								Part 11
Frost resistance ¹¹⁾	10	–	0	1	–	–	–	–	–	–	Part 10
Moisture expansion	5	–	Attribution by manufacturer’s declaration								Part 3
Impact resistance	–	–	Attribution by manufacturer’s declaration								Part 14
Small colour differences	–	–	Attribution by manufacturer’s declaration								Part 16
Lead and cadmium release	–	–	Attribution by manufacturer’s declaration								Part 17
Slip resistance/Coefficient of friction	–	–	Attribution by manufacturer’s declaration								Manufacturer to declare test method

¹⁾ Only for tiles with individual areas ≥ 4 cm².

²⁾ At least 1 m² with a minimum of 30 tiles. Whatever the number of tiles in 1 m², the test sample should be rounded to the nearest 10 tiles above. Conformity to acceptable quality level (AQL) 2.5 percent in accordance with IS 2500 (Parts 1 and 2) is an acceptable alternative to the procedure in Table 1.

³⁾ The sample size depends on the size of the tile.

⁴⁾ Only for tiles with individual surface areas > 0.04 m². In the case of tiles weighing < 50 g, a sufficient number shall be taken so as to form five test specimens, each weighing between 50 g and 100 g.

⁵⁾ *L* = lower specification limit.

⁶⁾ *U* = upper specification limit.

⁷⁾ Only for tiles with lengths ≥ 48 mm.

⁸⁾ Number of measurements.

⁹⁾ Number of test specimens.

¹⁰⁾ Per test solution.

¹¹⁾ There is no double sampling test procedure for these properties.

ANNEX A*(Foreword)***COMMITTEE COMPOSITION**

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

<i>Organization</i>	<i>Representative(s)</i>
In Personal Capacity (<i>L/109, Sarita Vihar, New Delhi</i>)	SHRI ASHOK KHURANA (Chairman)
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